with Dr Warden's compl

ON

THE APPLICATION

OF

PRISMATIC REFLECTION

TO THE

INVESTIGATION OF DISEASES SITUATED IN THE OPEN CAVITIES OF THE BODY.

By Adam Warden, M.D. F.R.C.S.E.

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NEW APPLICATION

OF THE

REFLECTING PRISM.

Through the medium of your widely circulated journal, I take the liberty of bringing under the notice of the profession a new application of the principle of illumination derived from prismatic reflection, to the examination of disease in the dark passages connected with the open cavities of the body.

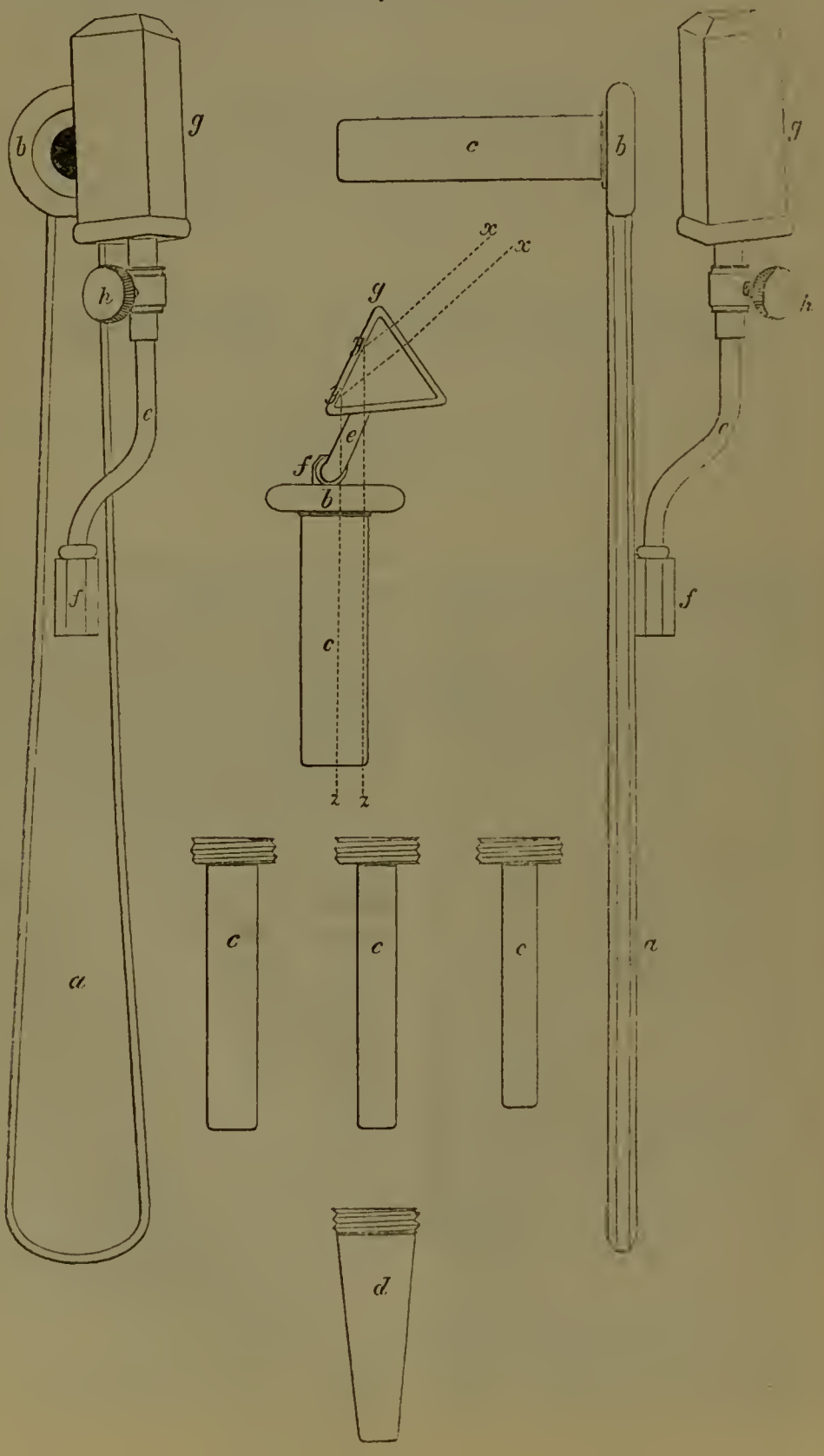
As a description of a mechanical invention, a communication* was made by me on the subject to the Royal Scottish Society of Arts last week; but I desire to take the earliest opportunity of submitting the contrivance to the professional public, in the hope that it may be found to afford assistance in the investigation, and facilities in the appropriate treatment, of several important classes of diseases, which, by their situation, are naturally removed from view, and from that intelligent cognizance which is requisite to a correct pathology, the only basis for truly scientific treatment in the living body; and I confidently hope that the utility of the invention will be further verified by the experience of the profession at a distance, as it has already been by those of my brethren here, who have had an opportunity of observing for themselves.

It may be proper to remark, that I, in common with many others, have often felt the defectiveness of our professional resources for affording light to permit an examination of the nature of a variety of darkly seated affections, which are daily coming under the notice of the practitioner. My attention was specially awakened to this subject by the difficulties attending a case which came under my notice in November last; and I thereafter directed my attention to devising some means of supplying the defect. The case to which I allude was chronic disease of the ear, attended with discharge, and much impaired hearing, of three years' standing, and my aim was at first confined to the construction of an instrument adapted to that part of the body; but the principle which I hit upon I soon found to be capable of being greatly extended, and applied to the examination of disease seated in parts still more remote from observation, and to which actual inspection has not before penetrated in the living body.

The means I employed for effecting the purpose are based on the principle of illumination by means of totally reflecting prisms of flint glass; and in order to render it intelligible to the reader, I have appended a diagram of

* "Description, with illustrations of a Totally Reflecting Prism, employed for illuminating the open cavities of the body, with a view to facilitate the examination of disease, and the application of remedial means in such situations. By Adam Warden, M.D. F.R.C.S.E. Communicated by Andrew Fyfe, M.D. F.R.S.E. &c."

the instrument constructed for making examination of the auditory canal,—as an inspection of that instrument, in connection with what I have to say with reference to the extension of the principle, will suffice to satisfy any one of its general applicability.



The narrow and indirect tract of the external auditory canal, and the hairs with which it is commonly beset, are, as is well known, the natural obstacles to a correct view of its inward course and termination. By the aid of the *speculum*, and owing to the moveable state of the cartilaginous portion of the tube, these difficulties in the way of observation are readily obviated. Sufficient light, however, to illuminate the yet dark passage remains the one desideratum, without which, to exhibit the actual condition of the membrane of the tympanum, the surgeon cannot pronounce as to the importance or curability of disease, nor resort, with confidence of its safety from danger, even to the popular remedy of the syringe.

Before describing the method of illumination which I have found fitted satisfactorily to fulfil this end, I beg to notice that, according to my experience, preternatural constriction of the auditory canal, from morbid thickening of its walls, exists to a greater or less extent as a complication of chronic disease of the external ear, and by forming a physical impediment to the access of sound, all measures directed to restore the function of hearing, irrespective of this condition of the passage, must prove comparatively ineffectual. The instrument which I submit to your notice is therefore formed with the view of its being adapted not only to the different development of the organ of hearing in youth and age, but also so as to form a series of dilators, applicable to the removal of stricture, upon the same principle as regulates the treatment of the same disease in other situations.

The instrument devised and represented in the accompanying diagram, consists of a straight ~~arm~~, *a a*, five inches in length, terminating in a ring *b*, of half an inch internal diameter, the ring grooved in its interior as a screw. To this screw are adapted four canulæ or straight tubes, *c*, of four, three, two, and one lines calibre, and another, *d*, of a funnel or tapering shape, applicable for preliminary exploration, and removal of any accumulated cerumen obstructing the passage of the light, also for affording a proper field for the passage of instruments, and other topical manipulation. From the middle of the straight handle arises a curved branch *e*, moveable in a pivot joint at *f* toward ~~the other~~ either side of the handle. This branch forms a stalk on which a prism of flint glass *g* is perched erect, to the level of the opening of the affixed canula. The prism rests in a metallic socket, and is made to revolve on its own axis at the touch of the finger, or to remain fixed in any desired position, by the aid of a small clamping screw, *h*. The instrument is thus complete for use. The canula is to be introduced into the ear to be examined, the patient being seated exposed to a good light. The surgeon placing himself conveniently opposite to the side of the patient, a face of the prism is turned towards the light, and it is made to revolve until the luminous spectrum is conveyed to the bottom of the canula, and to the surface sought to be observed. There is no difficulty in the adjustment of the position when the new relations of the light and of the object are familiarized by a little experience; and when once this adjustment is made, the full and clear illumination of the object is at once obtained, and with a degree of brilliancy exactly proportioned to the quantity of light employed in the particular observation.

The principle or theory consists in *total reflection:* the light is received by one side of the prism, is reflected from the second side, and emerges by the third side to the object illuminated, as represented by the dotted lines *x y z*, and whence its view is revealed to the eye. The illumination is not preternatural or dazzling, such as would alter the real features of disease, but natural, and such as the eye is familiar with. The advantage of this flat natural light will be fully appreciated by professional eyes; and I am persuaded, from ample experiment, that any means of concentrating light by lenses, or converging mirrors substituted for the prism, would not improve the serviceableness of the instrument exhibited, although by their subsidiary employment they may be made to contribute to its efficiency, whenever, under extraordinary circumstances, more intense light is required.

The method of illuminating diseased parts by the medium of the prism is relieved from the intricacies inseparable from the employment of a reflecting speculum, whose curve must be anew adapted by the manufacturer to the focal distance of the object to be viewed, otherwise it is indistinct and distorted,

as in a false mirror. Neither is the method invented by me liable to the objections applicable to various ingenious contrivances for the same end, which we owe to distinguished members of the profession. By the convenient position of the light in prismatic illumination, it is not liable to be intercepted by the shadow of the observer, as is the case with any direct light proceeding from behind him,—a disadvantage we are not free from even where sunlight is employed; and if a lamp and lens be placed between the eye and the object viewed, not only does the dazzling artificial medium alter the characteristic aspect of disease, but such apparatus, in order to guide any surgical procedure, must be kept strictly in such a position as necessarily to interfere with any convenient measures in the removal of foreign bodies, or other manual operations. By a construction of instrument suited to the situations of disease in the different cavities, increased facilities in surgical practice, I feel warranted in asserting, are largely attainable through the adoption of the method proposed by me.

It will not fail to appear of no small *moral* importance, that by this method of obtaining observation and applying satisfactory treatment in the uterine diseases of females, the withdrawn position as it were, of the light, is calculated to lessen the misery attending all professional interference in such cases.

In conclusion, I may mention, that I have satisfied myself by varied experiments that a Totally Reflecting Prism placed in the angle of a bent cannula, and illuminated by a second prism, in the manner already described, will afford a satisfactory view of objects whose situation precludes the possibility of direct observation—such as the opening of the Eustachian tube and of the glottis, the position of foreign bodies detained in the throat, &c. For the sake of illustration, I may state, that by a simple arrangement, consisting of two tubes, each twelve inches long and one inch diameter, embracing at their point of junction, at right angles to each other, a right-angled prism, I have been enabled to make inspection with the utmost accuracy of exquisitely coloured drawings of the morbid anatomy of the eye; obtaining by the arrangement described a reflection of the image presented at the opposite extremity of such an instrument, and that in all the brilliancy of sunlight-view.

I hoped to have accompanied this communication with a view of the instrument, which is in course of construction here, under my directions, applicable to the survey of the region of the throat; but as it has already undergone several modifications, and is not yet fully conformable to my wishes, I must reserve my description of it for a future opportunity. Furthermore, I find that a diseased surface can be accurately inspected at the extremity of a straight tube of twelve inches long and a quarter of an inch diameter; and I indulge the hope that within this range a more satisfactory treatment of highly seated strictures and diseases of the straight gut, as well as of diseases of the urinary organs, may be thereby attained. That the latter expectation is not altogether visionary may be inferred from the fact, that the straight cannula of the *brise-pierre* of Baron Heurteloup has a diameter of one third of an inch.—I am, sir,

Your obedient servant,

ADAM WARDEN,
M.D. F.R.C.S.E. &c.

3, Baxter's Place, Edinburgh,
May 4, 1844.

WILSON AND OGILVY, 57, Skinner Street, Snowhill, London.